CLAIMS

We claim:

1. An apparatus for performing low level sulfur UV fluorescence detection comprising:

an oxidation or combustion chamber including:

a sample inlet,

an oxidizing agent inlet,

a oxidation zone, and

a oxidized sample outlet;

a transfer tube connected to the oxidized sample outlet;

an UV interference reduction system capable of reducing or eliminating interference from nitrogen oxides; and

a detector/analyzer system including:

an excitation light source,

a UV chamber having:

an excitation light port in optical communication with the light source,

an oxidized sample inlet connected to the transfer tube,

an oxidized sample outlet for exhausting the oxidized sample from the chamber after irradiation from the excitation light,

a fluorescent light port oriented at an angle to the excitation light, where the angle is sufficient to reduce or eliminate excitation light from entering the fluorescent light port;

a fluorescent light detector in optical communication with the fluorescent light port capable of converting the detected light into an electrical output signal, and

an analyzer in electrical communication with the detector for converting the electrical output signal into a concentration of sulfur in the sample based on sulfur dioxide fluorescence.

2. The apparatus of claim 1, wherein the nitrogen removal system comprises an ozone generator.

3. The apparatus of claim 1, wherein the generated ozone is introduced into the oxidizing agent

inlet of the combustion chamber.

4. The apparatus of claim 1, wherein the generated ozone is introduced into the oxidizing zone through an ozone inlet.

5. The apparatus of claim 1, wherein the generated ozone is introduced into the combustion chamber at its distal end through an ozone inlet.

6. The apparatus of claim 1, wherein the generated ozone is introduced into the transfer tube.

7. The apparatus of claim 1, wherein the generated ozone is introduced into an ozone chamber interposed between the combustion chamber and the UV chamber through an ozone inlet.

8. The apparatus of claim 1, wherein the generated ozone is introduced into a first sub-chamber of a bifurcated UV chamber through an ozone inlet.

9. The apparatus of claim 2, further comprising a nitrogen gas removal system into the oxidizing agent inlet to remove trace amount of nitrogen gas (N_2) prior to the oxidizing agent entering the oxidizing agent inlet of the combustion chamber.

10. The apparatus of claim 1, wherein the UV chamber further includes an optical filter associated with the fluorescent port and the detector is a PMT.

11. A method for improving low level sulfur detection using UV fluorescent spectrometry, comprising the steps of:

introducing a sample and sufficient oxidizing agent to completely oxidize all oxidizable sample components into their corresponding oxides into a combustion chamber for a time and at an elevated temperature sufficient to convert substantially all oxidizable components into there corresponding oxides to produce an oxidized sample; and

introducing an UV interference reduction agent into the sample, the oxidizing agent, the oxidizing sample and/or the oxidized sample in an amount sufficient to substantially eliminate

interfering nitrogen oxides to produce a modified oxidized sample.

12. The method of claim 11, further comprising the steps of:

forwarding the modified oxidized sample to a UV chamber;

irradiating the modified oxidized sample with excitation light;

detecting fluorescent light emitted by electronically excited SO_2 molecules in the modified oxidized sample; and

converting the detected light into a concentration of sulfur in the sample.

13. The method of claim 1, wherein the nitrogen removal agent comprises a NO reactive species selected from the group consisting of ozone and hydrogen peroxide.

14. The method of claim 13, wherein the nitrogen removal agent comprises ozone.

15. The method of claim 14, wherein the ozone is introduced into the oxidizing agent.

16. The method of claim 14, wherein the ozone is introduced into the oxidizing sample.

17. The method of claim 14, wherein the ozone is introduced into the oxidized sample.

18. The method of claim 11, further comprising the step of:

contacting the oxidizing agent with a nitrogen gas removal reagent to reduce or eliminate nitrogen gas from the oxidizing agent.

19. The method of claim 11, wherein the oxidizing gas comprising an oxygen containing gas.

20. The apparatus of claim 1, wherein the oxidizing gas comprising an oxygen containing gas.